STAT100 Problem Set 6: Normal Random Variables

You need to submit a Word document or PDF for this assignment. Make sure you do the following:

1. **Upload only one file/document in ELMS for Problem Set 6**
2. **Include your name in the document in the upper left-hand corner. Under your name, write STAT 100 and your section number. Write Problem Set 6 centered on the page.**
3. **Number and letter your answers to the questions accordingly.**
4. **Carefully read all problems and follow all instructions.**
5. **Upload the assignment in ELMS before the deadline of Sunday 4/3 at 11:59 PM otherwise it is considered late. Make sure you save your document on your computer or email it to yourself so that you keep an electronic copy.**

Students should refer to the Tutorial for Problem Set 6 as they are working on this problem set. All Tutorials for Problem Sets can be found in the STAT100 ELMS course under Modules.

There is no data file needed for Problem Set 6. All the necessary information is provided, and all work can be completed in RStudio without opening a data file.

Problem Set 6 has nine questions worth 25 points. Read each question carefully and follow all instructions. **Please follow these instructions for providing your responses:**

- **For #1.b., #3, #4.b., #6, #7.b., and #8, you MUST provide R code and RStudio output. In addition, you MUST include your name in the comments for the R code for #1.b., #3, #4.b., #6, #7.b., and #8.**
- **For all other questions on Problem Set 6, you should type your responses directly in the document you submit for Problem Set 6. You should NOT provide R code or RStudio output for those questions.** Be sure to *show all work to receive full credit*.

Based on national data, information is provided below about high school grade point average (GPA), for a GPA scale with a minimum value of 0.0 and a maximum value of 4.0. Data are provided separately for all students, female students and male students. For Problem Set 6, ***you can assume that the high school GPA variable is normally distributed for each of the different groups.***

Student Group	**Mean High School GPA (μ)**	**Standard deviation (σ) of GPA**
All students	3.03	0.52
Female students	3.12	0.51
Male students	2.94	0.54

1. What is the probability that *any randomly selected student (male or female)* has a high school GPA lower than 3.15?
    a. First, solve this problem using the STAT100 Z table; **do not use RStudio**. Be sure that you use appropriate notation, show all work and provide the probability as a decimal rounded to four decimal places. *See the Tutorial for Problem Set 6 for examples of appropriate notation and showing work.*
    b. Then, **solve this problem using RStudio** and include an image showing the R code you used to calculate the probability, including comments, and with output from the RStudio Console. **IMPORTANT INSTRUCTIONS: you MUST include your name in the comments for the R code for #1.b.**
2. What is the probability that *a randomly selected male student* has a high school GPA lower than 3.15? Solve this problem using the STAT100 Z table; **do not use RStudio for this problem**. Be sure that you use appropriate notation, show all work and provide the probability as a decimal rounded to four decimal places. *See the Tutorial for Problem Set 6 for examples of appropriate notation and showing work.*
3. What is the probability that *a randomly selected female student* has a high school GPA lower than 3.15? **Solve this problem using RStudio** and include an image showing the R code you used to calculate the probability, including comments, and with output from the RStudio Console. **IMPORTANT INSTRUCTIONS: you MUST include your name in the comments for the R code for #3**.

4. What is the probability that *any randomly selected student (male or female)* has a high school GPA higher than 2.50?

    a. First, solve this problem using the STAT100 Z table; **do not use RStudio**. Be sure that you use appropriate notation, show all work and provide the probability as a decimal rounded to four decimal places. *See the Tutorial for Problem Set 6 for examples of appropriate notation and showing work*

    b. Then, **solve this problem using RStudio** and include an image showing the R code you used to calculate the probability, including comments, and with output from the RStudio Console. **IMPORTANT INSTRUCTIONS: you MUST include your name in the comments for the R code for #4.b**.

5. What is the probability that *any randomly selected student (male or female)* has a high school GPA between 2.25 and 3.75? Solve this problem using the STAT100 Z table; **do not use RStudio for this problem**. Be sure that you use appropriate notation, show all work and provide the probability as a decimal rounded to four decimal places. *See the Tutorial for Problem Set 6 for examples of appropriate notation and showing work.*

6. What is the probability that a *randomly selected female student* has a high school GPA between 3.25 and 4.00? **Solve this problem using RStudio** and include an image showing the R code you used to calculate the probability, including comments, and with output from the RStudio Console. **IMPORTANT INSTRUCTIONS: you MUST include your name in the comments for the R code for #6**.

7. If a *male student* has a high school GPA of 3.80, what percentile would this be for the distribution of high school GPA for all male students? Provide the percentile as a whole number.

    a. First, solve this problem using the STAT100 Z table; **do not use RStudio**. Be sure that you use appropriate notation and show all work. *See the Tutorial for Problem Set 6 for examples of appropriate notation and showing work.*

    b. Then, **solve this problem using RStudio** and include an image showing the R code you used to calculate the probability, including comments, and with output from the RStudio Console. **IMPORTANT INSTRUCTIONS: you MUST include your name in the comments for the R code for #7.b**.

8. For *all students (male or female)*, find the high school GPA that would be in the 67th percentile of the distribution of high school GPA values for all students. Round the GPA value to two decimal places. **Solve this problem using RStudio** and include an image showing the R code you used to calculate the probability, including comments, and with output from the RStudio Console. **IMPORTANT INSTRUCTIONS: you MUST include your name in the comments for the R code for #8**.

9. Which would be more likely: a female student with a high school GPA of at least 3.75, or a male student with a high school GPA of at least 3.60? Solve this problem using the STAT100 Z table; **do not use RStudio for this problem**. Be sure that you use appropriate notation, show all work and explain your reasoning.